

Cod (*Gadus morhua*) in Subdivision 5.b.1 (Faroe Plateau)

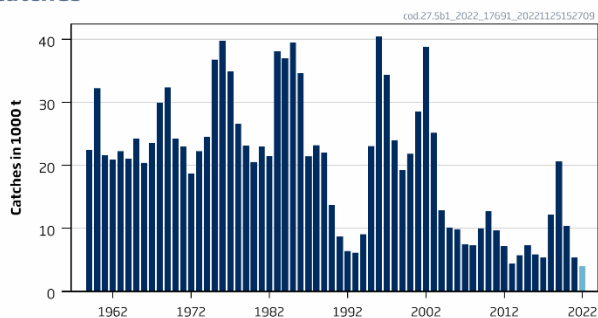
ICES advice on fishing opportunities

ICES advises that when the MSY approach and precautionary considerations are applied, there should be zero catch for the years 2023 and 2024. ICES is not in a position to advise on the corresponding level of fishing effort.

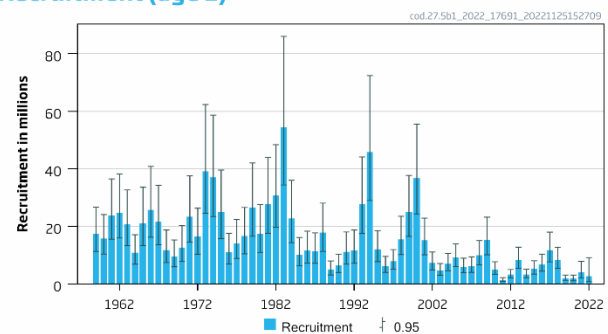
Stock development over time

Fishing pressure on the stock is above F_{MSY} , and below F_{pa} and F_{lim} ; spawning-stock size is below MSY $B_{trigger}$, B_{pa} , and B_{lim} .

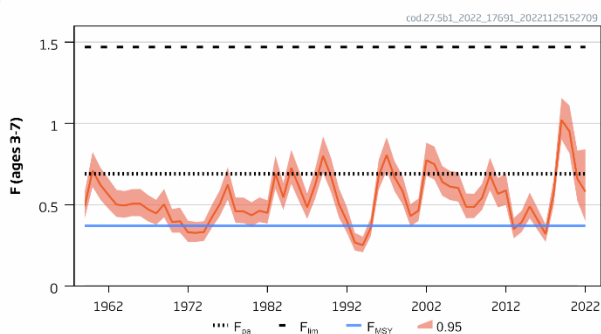
Catches



Recruitment (age 1)



F



SSB

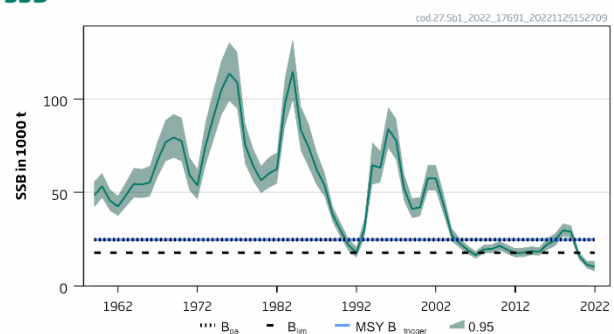


Figure 1 Cod in Subdivision 5.b.1. Summary of the stock assessment. The assessment produces an estimate of F in 2022. Catches in 2022 are assumed.

Catch scenarios

Table 1 Cod in Subdivision 5.b.1. Assumptions made for the interim year and in the forecast.

Variable	Value	Notes
$F_{ages\ 3-7}$ (2022)	0.58	Based on catch-at-age estimate of 4064 tonnes in 2021
SSB (2023)	9682	Based on $F = 0.58$; tonnes
$R_{age\ 1}$ (2023)	4010	Median of resampled estimates from 2011 to 2021; in thousands
Landings (2022)	4064	Catch estimate for 2022 based on catch statistics to the end of September extrapolated to the entire year; in tonnes
Discards (2022)	0	Discarding is considered negligible; in tonnes

Table 2 Cod in Subdivision 5.b.1. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2023)	$F_{(3-7)}$ (2023)	SSB (2024)	% SSB change*	% advice change**
ICES advice basis					
MSY approach: $F = 0$	0	0	15161	57	-100
Other scenarios					
$F_{MSY} \times SSB_{2023} / MSY_{B_{trigger}}$	1173	0.145	13869	43	-47
$F = F_{2022}$	3893	0.59	10666	10	76
$F = F_{pa}$	5068	0.85	9269	-4	130
$F = F_{lim}$	8223	2.07	5737	-41	273

* SSB (2024) relative to SSB (2023) (9682 tonnes).

**The advice value for 2023 relative to the advice value for 2022 as issued in 2021 (2206 tonnes).

The catch advice for 2023 is zero because the biomass is estimated to remain below B_{lim} under all catch scenarios.

Basis of the advice

Table 3 Cod in Subdivision 5.b.1. The basis of the advice.

Advice basis	MSY approach
Management plan	A management plan (Anon., 2019) was implemented in 2021, but ICES has not been requested to evaluate it.

Quality of the assessment

The 2018 to 2020 recruitment estimates have been revised downwards in the updated assessment. There is a tendency for the assessment to overestimate biomass and recruitment while underestimating fishing mortality, which may indicate model or data issues.

The assessment is mainly driven by catches, with little weight given to survey indices.

The plot does not show the line for fishing mortality that ends in 2021 because this year's assessment estimated fishing mortality in the current year (year y) while the last year in previous assessments was the last full calendar year (year $y-1$) (Figure 2).

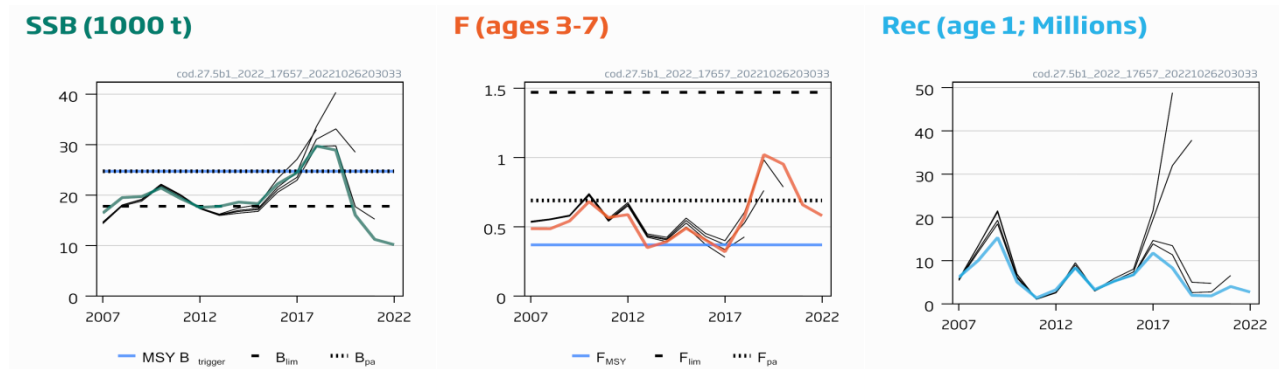


Figure 2 Cod in Subdivision 5.b.1. Historical assessment results. Results of the last five assessments are plotted, with the solid coloured line representing the current assessment.

Issues relevant for the advice

Faroe Plateau cod and Faroe haddock are caught in a mixed fishery. However, Faroe Plateau cod is assessed to be in a poor state (below B_{lim} since 2020), and the MSY approach implies a much larger reduction in fishing effort for cod than for haddock. Fishing mortality on the stock has rarely been less than 0.4 in the past 60 years and has recently been larger than 0.7.

In 2021 the Faroese authorities implemented a management plan (Anon., 2019) with a control rule that regulates the number of fishing days for cod, haddock, and saithe in the Faroe Plateau fishery. The management plan has not been evaluated by ICES and therefore ICES bases its advice on the MSY approach.

ICES cannot quantify the relationship between effort and F for this stock.

The stock recruit relationship does not give a clear indication of the level of B_{lim} , however other candidates for B_{lim} would still lead to zero catch advice.

Reference points

Table 4 Cod in Subdivision 5.b.1. Reference points, values, and their technical basis. All weights are in tonnes.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	24739	B_{pa}	ICES (2022c)
	F_{MSY}	0.37	Stochastic simulations assuming segmented regression, Ricker and Beverton and Holt stock–recruitment relationships	ICES (2022c)
Precautionary approach	B_{lim}	17803	B_{loss} in 1992 from the 2022 assessment	ICES (2022c)
	B_{pa}	24739	$B_{lim} \times \exp(1.645 \times \sigma)$, where $\sigma = 0.20$	ICES (2022c)
	F_{lim}	1.47	Stochastic simulations (ICES, 2017): the F that gives a 50% probability of $SSB > B_{lim}$	ICES (2022c)
	F_{pa}	0.69	F_{P05} ; the F that leads to $SSB \geq B_{lim}$ with 95% probability	ICES (2022c)
Management plan	SSB_{mgt}	Not applicable		
	F_{mgt}	Not applicable		

Basis of the assessment

Table 5 Cod in Subdivision 5.b.1. Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2022b)
Assessment type	SAM with catch-at-age data and age-disaggregated indices, using catches in the model and in the forecast (ICES, 2022c)
Input data	Commercial catches, ages, and length frequencies from catch sampling; survey indices (FO-GFS-Q1, G1264, and FO-GFS-Q3, G3284); annual maturity data from FO-GFS-Q1 (G1264); natural mortality set at 0.2. Preliminary estimate of catch-at-age in the year (January to September) in which the assessment is carried out.
Discards and bycatch	Discarding is considered negligible
Indicators	Co-occurrence of high recruitment of cod with sandeel abundance
Other information	The stock was interbenchmarked in 2022 (ICES, 2022a)
Working group	North-Western Working Group (NWWG)

History of the advice, catch, and management

Table 6 Cod in Subdivision 5.b.1. ICES advice and catch. All weights are in tonnes.

Fishing year	ICES advice	Catch corresponding to advice	Agreed TAC***	ICES catch
1987	No increase in F	< 31000		21391
1988	No increase in F (revised estimate)	< 29000 (23000)		23182
1989	No increase in F	< 19000		22068
1990	No increase in F	< 20000		13692
1991	TAC	< 16000		8750
1992	No increase in F	< 20000		6396
1993	No fishing	0		6107
1994	No fishing	0	8500/12500**	9046
1995	No fishing	0	12500*	23045
1996	F at lowest possible level	-	20000**	40422
1997	80% of F(95)	< 24000		34304
1998	30% reduction in effort from 1996/97	-		24005

Fishing year	ICES advice	Catch corresponding to advice	Agreed TAC***	ICES catch
1999	F less than proposed F_{pa} (0.35)	< 19000		19245
2000	F less than proposed F_{pa} (0.35)	< 20000		21833
2001	F less than proposed F_{pa} (0.35)	< 16000		28577
2002	75% of F(2000)	< 22000		38834
2003	75% of F(2001)	< 32000		25167
2004	25% reduction in effort	-		12840
2005	Rebuilding plan involving large reduction	-		10119
2006	Rebuilding plan involving large reduction	-		9844
2007	Rebuilding plan involving large reduction in effort	-		7511
2008	No fishing; development of a rebuilding plan	0		7315
2009	No fishing; development of a rebuilding plan	0		9979
2010	No fishing; development of a rebuilding plan	0		12762
2011	Reduce F to below F_{pa}	< 16000		9692
2012	MSY framework, reduce F by 30%	< 10000		7205
2013	MSY approach, $F < 0.20$	< 4800		4473
2014	MSY approach, reduce F by 69%	< 3600		5711
2015	MSY approach, reduce F by 23%	< 4500		7329
2016	Lowest possible level (LPL) and develop a mixed-fishery management plan	-		5876
2017	MSY approach ($F \leq 0.16$)	≤ 2800		5360
2018	MSY approach ($F \leq 0.22$)	≤ 4579		12214
2019^	MSY approach	≤ 9354		20609
2020	MSY approach	≤ 11679		10438
2021	MSY approach	≤ 6247		5417
2022	MSY approach	≤ 2206		
2023	MSY approach	0		
2024	MSY approach	0		

* From 1 September in the quota year to 31 August the following year.

** The TAC was increased during the quota year.

*** Not applicable since 1997.

^ Since 2019 fishing year equals to calendar year

History of the catch and landings

Table 7 Cod in Subdivision 5.b.1. Catch distribution by fleet in 2021 as estimated by ICES. All weights are in tonnes.

Catch	Landings				Discards
	Longlines	Handlines	Trawls	Gillnets	
5417	58%	10%	31%	1%	Negligible
5417					

Table 8 Cod in Subdivision 5.b.1. History of commercial catch and landings; catches in this table are those officially reported by each country and may differ from the ICES estimated catch. All weights are in tonnes.

Year	Denmark	Faroe Islands	France	Germany	Iceland	Norway	Greenland	Portugal	UK	Total
1986	8	34492	4	8		83			-	34595
1987	30	21303	17	12		21			8	21391
1988	10	22272	17	5		163				22467
1989		20535		7		285				20827
1990		12232		24		124				12380
1991		8203	*	16		89			1	8309
1992		5938	3**	12		39			74	6066
1993		5744	1**	+		57			186	5988
1994		8724		2**		36			56	8818

Year	Denmark	Faroe Islands	France	Germany	Iceland	Norway	Greenland	Portugal	UK	Total
1995		19079	2**	2		38			43	19164
1996		39406	1**	+		507			126	40040
1997		33556		+		410			61**	34027
1998		23308				405			27**	23740
1999		19156		39		450			51	19696
2000		***	1	2		374			18	395
2001		29762	9**	9		531*			50	30361
2002		40602	20	6	5	573			42	41248
2003		30259	14	7		447			15	30742
2004		17540	2	3**		414		1	15	17975
2005		13556				201			24	13781
2006		11629	7	1**		49	5			11691
2007		9905	1**			71	7		360	10344
2008		9394	1			40			383	9818
2009		10736	1			14	7		300	11058
2010		13878	1			10			312	14206
2011		11348								11348
2012		8437			28					8466
2013		5331			20		2			5333
2014		6655				2			226	6883
2015		7812				33	14		367	8174
2016		6736				31	5		456	7232
2017		6215	2			16	5		388	6625
2018		13297	2			69			504	13872
2019		22282	1			219			238	22735
2020		10614	2			163			690	11470
2021		5879	3			65			0	5947

* Included in ICES Subdivision 5.b.2.

** Reported as ICES Division 5.b.

*** No reported catch.

Summary of the assessment

Table 9 Cod in Subdivision 5.b.1. Assessment summary.

Year	Recruitment			SSB			Catch	F		
	Age 1	97.5 percentile	2.5 percentile	Mean	97.5 percentile	2.5 percentile		Mean F _{ages 3-7}	97.5 percentile	2.5 percentile
	Thousands			Tonnes			Tonnes			
1959	17348	26663	11287	48367	55770	41946	22415	0.49	0.58	0.41
1960	15799	24127	10346	53273	60336	47037	32255	0.71	0.83	0.61
1961	23801	36499	15521	45526	51612	40157	21598	0.62	0.73	0.53
1962	24729	38223	15999	42476	48244	37397	20967	0.56	0.66	0.48
1963	20838	32702	13278	48482	55559	42306	22215	0.50	0.59	0.43
1964	10801	17086	6828	54574	63091	47207	21078	0.50	0.58	0.42
1965	21172	33598	13341	54203	62495	47011	24212	0.51	0.60	0.43
1966	25759	40865	16237	55313	64043	47774	20418	0.51	0.60	0.43
1967	21610	34242	13638	67274	77637	58294	23562	0.47	0.56	0.40
1968	11776	18739	7400	76878	88724	66614	29930	0.45	0.53	0.38
1969	9510	15274	5921	79339	91839	68540	32371	0.50	0.60	0.42
1970	12612	20349	7816	77417	89990	66600	24183	0.39	0.47	0.33
1971	23410	37595	14577	59294	68919	51014	23010	0.40	0.48	0.33
1972	16456	26324	10288	53714	62466	46188	18727	0.33	0.40	0.27
1973	39148	62357	24578	74725	87204	64032	22228	0.33	0.39	0.27

Year	Recruitment			SSB			Catch	F		
	Age 1	97.5 percentile	2.5 percentile	Mean	97.5 percentile	2.5 percentile		Mean	97.5 percentile	2.5 percentile
	Thousands			Tonnes			Tonnes	F _{ages 3-7}		
1974	37056	58684	23399	90084	104499	77658	24581	0.33	0.40	0.28
1975	24976	39612	15747	104755	120358	91174	36775	0.42	0.50	0.36
1976	11013	17572	6902	113498	130205	98935	39799	0.50	0.59	0.43
1977	14088	22452	8840	108766	125039	94611	34927	0.62	0.73	0.53
1978	16695	26599	10478	75310	87031	65167	26585	0.46	0.55	0.39
1979	26421	42067	16594	64170	73516	56013	23112	0.46	0.54	0.39
1980	17387	27637	10939	56472	64219	49660	20513	0.44	0.52	0.37
1981	27800	43974	17575	60128	68823	52531	22963	0.46	0.55	0.39
1982	30849	48415	19656	62475	71316	54730	21489	0.45	0.53	0.38
1983	54416	86059	34408	97371	111346	85149	38133	0.69	0.80	0.60
1984	22727	35991	14351	114644	132317	99331	36979	0.55	0.64	0.47
1985	10078	16118	6301	83333	96050	72299	39484	0.73	0.84	0.63
1986	11530	18356	7243	74051	86619	63307	34595	0.61	0.71	0.52
1987	11267	17759	7148	62112	71625	53862	21391	0.48	0.57	0.41
1988	17823	28083	11311	53751	60580	47693	23182	0.62	0.72	0.54
1989	4981	7967	3114	38187	42700	34151	22068	0.80	0.92	0.70
1990	6385	10302	3957	29684	33961	25947	13692	0.68	0.79	0.58
1991	11139	18080	6862	21823	25432	18727	8750	0.50	0.60	0.42
1992	11593	18718	7180	17803	20876	15182	6396	0.40	0.49	0.33
1993	27829	44125	17551	30273	35906	25524	6107	0.27	0.33	0.22
1994	45807	72399	28983	64544	76717	54302	9046	0.25	0.30	0.21
1995	11958	18493	7732	63136	72238	55180	23045	0.36	0.42	0.31
1996	6205	9570	4023	83921	95518	73731	40422	0.68	0.78	0.59
1997	7815	11946	5112	77661	89449	67426	34304	0.81	0.92	0.71
1998	15504	23508	10225	52059	59870	45268	24005	0.67	0.77	0.58
1999	24940	37708	16495	41221	46898	36232	19245	0.58	0.68	0.50
2000	36745	55529	24315	41993	47312	37272	21833	0.43	0.50	0.37
2001	15220	22855	10135	57540	64813	51084	28577	0.46	0.54	0.40
2002	7339	11113	4846	57342	64514	50967	38834	0.77	0.88	0.68
2003	4608	7092	2994	42930	48982	37626	25167	0.75	0.86	0.65
2004	6993	10598	4614	27117	30763	23903	12840	0.64	0.74	0.56
2005	9214	13926	6097	22768	25611	20240	10119	0.61	0.71	0.53
2006	5910	8938	3908	19241	21617	17126	9844	0.60	0.70	0.52
2007	6156	9382	4039	16451	18529	14605	7511	0.49	0.57	0.42
2008	10021	15086	6657	19519	22023	17300	7315	0.49	0.57	0.42
2009	15337	23184	10145	19716	22142	17557	9979	0.54	0.63	0.47
2010	5060	7700	3325	21423	24025	19103	12762	0.68	0.79	0.59
2011	1386	2173	884	19341	22010	16996	9692	0.57	0.66	0.48
2012	3253	5020	2108	17570	20124	15339	7205	0.59	0.69	0.50
2013	8339	12824	5423	17777	20474	15436	4473	0.35	0.42	0.29
2014	3318	5143	2141	18621	21082	16448	5711	0.39	0.46	0.33
2015	5228	8035	3402	18325	20673	16243	7329	0.49	0.57	0.42
2016	6741	10316	4405	22227	25549	19337	5876	0.41	0.48	0.34
2017	11754	18031	7662	24456	28092	21292	5360	0.32	0.38	0.27
2018	8294	12773	5386	29720	33352	26484	12214	0.57	0.66	0.49
2019	1953	3093	1233	28922	32406	25812	20609	1.02	1.16	0.90
2020	1847	3066	1112	16065	18173	14202	10438	0.95	1.11	0.82
2021	4010	7866	2044	11245	13412	9428	5417	0.66	0.83	0.52
2022	2724	9118	814	10190	13394	7752	4064*	0.58	0.84	0.40

* Catch estimate based on catch statistics to the end of September extrapolated to the entire year.

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